Int J Life Cycle Assess (2011) 16:283–284
DOI 10.1007/s11367-011-0262-1

BOOK REVIEW

Global life cycle impact assessments of material shifts. The example of a lead-free electronics industry

Anders S. G Andrae Springer London 2010, 183 pp, 106.95 €, ISBN 978-1-84882-660-1; e-ISBN 978-1-84882-661-8 DOI 10.1007/978-1-84882-661-8

Walter Klöpffer

Received: 3 February 2011 / Accepted: 5 February 2011 / Published online: 22 February 2011

Abstract This book provides detailed information about comparative LCA of different solders used in electronics. As Life Cycle Impact Assessment, the Japanese LIME method is used.

Keywords Solders · Pb · Leadfree solders · Electronics · LIME

This book offers several features which are not common in the life cycle assessment (LCA) literature. First of all, it treats a topic which traditionally belongs to material flow analysis with a technique belonging to LCA, life cycle impact assessment (LCIA). Second, the special variant of LCIA: LIME, a Japanese method not yet fully documented in English and not much used outside its country of origin. Actually, the work described was performed in collaboration with Prof. Norihiro Itsubo and his group at Musashi University and the LCA methodology group at National Institute of Advanced Industrial Science and Technology headed by Prof. Atsushi Inaba. Third, advanced elements not frequently used in life cycle practice, especially consequential LCA, are applied in this work.

LIME is an endpoint (damage) LCIA method starting with 11 impact categories and offers a weighing via "willingness to pay" and monetisation of environmental damages. This latter feature is clearly problematic in long lasting effects such as climate change, but as the recent history of accepting man-made global warming showed, it is the only language some influential people understand.

W. Klöpffer (✉)
LCA Consult & Review,
Am Dachsberg 56E,
60435 Frankfurt am Main, Germany
e-mail: walter.kloepffer@t-online.de

The book is clearly a monograph on a special but environmentally, technically and economically important topic. It is divided into nine chapters, which are as follows:

1. Introduction
2. Interconnection Materials—Technical Research Status
3. Environmental Life Cycle Assessment from a LIME Perspective
4. Methodology
5. LCA Case Studies of Solders
6. LCAs of Pb Solders vs. Conductive Adhesives
7. Discussion
8. Conclusions
9. Looking Ahead

Each chapter is preceded by a short abstract. The style of the book is report-like and includes many acronyms, not all of them explained. The systems compared (with Pb and lead-free solders and conductive adhesives) are described in the necessary detail to be useful for the expert. In addition to the LIME aggregation, the global warming potential and other indicator results are used to draw conclusions, including resources and toxicity.

Incomplete data for several systems investigated (e.g. leaching of Pb out of landfills) as well as the development of LC(I)A models (especially in consequential LCA) make

general conclusions difficult, although the comparison of specific systems shows advantages for one of the alternatives. With regard to LCA, the author concludes (p. 176) that the method *is* “ideally a rather quick but still powerful screening tool; LCAs should be performed continually in society to detect trends and develop the methodology. LCAs are not a one-time effort but need continuous updates if they are to support policy makers.” And who would object that “Some kind of mandatory reporting of LCI data, similar to economic data, would be required.”

The reader who expects simple answers, as for instance, Pb is always bad for the (cradle-to-grave) environmental behaviour of products, will be disappointed by the results presented in this book. But why should LCA produce simple answers? There exists the alternative “precautionary principle”, in this problem in the form of “avoid highly toxic substances likely to reach humans or the environment”. LCA is better used for learning how to design better products, and I think that the author has the same opinion (see quotations above).